

ENGINEERING HYDROLOGY

Paper Code: ETCE-307

Paper: Engineering Hydrology

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective:

1. To introduce students to various methods of estimation and analysis, precipitation and abstraction from rainfall and stream flow.
2. Assessment of stream flow and design principles of Dams, Weirs and Barrage, estimation of all parameters and characteristics related to hydrological aspects of catchment studies.

UNIT I

Introduction: Importance of Hydrology in relation to water resources development, Hydrology cycle, climatic and meteorological aspects, Water budget equation, Applications of hydrology in engineering.

Precipitation: Types, measurements, rain gauges, errors in measurements, check for consistency, missing data, Areal mean, mass curves, intensity duration frequency curves, depth area duration curves, and rainfall distribution in India.

Abstractions from Precipitation: Evaporation, measurements, empirical equation and analytical methods for evaporation estimation, Reservoir evaporation and methods for its reduction, Transpiration, Evapo-transpiration, Interception, Depression storage, Infiltration process and measurements, Infiltration capacities, Horton's equation, Infiltration indices.

[T1,T2][No. of Hours: 12]

UNIT II

Stream flow measurement: Measurement of stage and velocity, Area velocity method, chemical and Tracer method, Electromagnetic and ultrasound method, indirect methods, Stage discharge relationships.

Runoff : Runoff characteristic of streams, Rainfall-runoff correlation, Empirical equations, flow duration curve, flow mass curve, calculation of storage / maintainable demand, Sequent peak algorithm, Droughts, causes and management.

[T1,T2][No. of Hours: 10]

UNIT III

Hydrographs : Hydrograph and its components, Factors affecting flood hydrograph, components of hydrograph, basic flow separation techniques, effective rainfall, Unit hydrographs, concept of time invariance and linear response, Applications and derivation of unit hydrographs, complex storm, Unit hydrograph of different durations, methods of superposition and S-curve, Synthetic unit hydrograph, dimensionless unit hydrograph, Instantaneous unit hydrograph, Uses and limitations of unit hydrographs.

[T1,T2][No. of Hours: 10]

UNIT IV

Floods: Computations of peak floods by empirical formulae, by rational method and by unit hydrograph method, CWC recommendations for design flood values, flood estimation by Gumbel's Method, flood routing principles, reservoir routing, Floods in major Indian rivers, Flood damage, causes and remedial measures

Ground Water Hydraulics: Sources of ground water, flow through porous media, Energy and momentum concepts applied to groundwater flow, groundwater storage and derivation of the mass balance equation, potential and stream functions, Characteristics of wells and their yield, recharging ground water.

[T2][No. of Hours: 12]

Text Books:

- [T1] K. Subramanya , "Engineering hydrology" , Tata Mc Graw Hill.
[T2] Elementary Engineering Hydrology, Deodhar, Pearson Education

References Books:

- [R1] Chow, Maidment and Mays, "Applied Hydrology", Mc Graw Hill.
[R2] D.K.Todd , "Gound water hydrology", John Wiley India Edition.
[R3] Manning, "Applied Principles of Hydrology", CBS.

- [R4] Wurbs, "Water Resource Engineering", Prentice Hall India.
- [R5] H. M. Raghunath 2006, Hydrology: Principles, Analysis and Design, New Age International Publisher
- [R6] S.K. Garg, "Hydrology and Water Resources Engineering", Khanna Publishers.